English translation of SE 0004821-5

Technical field of the invention

The present invention concerns a device for the binding of pulp bales with wire drawn from a wire magazine, preferably a reel of wire, comprising a feeding means for feeding and tightening the wire, a guide means for guiding the wire round the object during forward feeding, means for cutting the tightened wire and holding and twisting together the ends thereof, and a take-up unit for taking up the slack loop that arises when the wire is tightened.

Brief description of known technology

Pulp bales are bound by means of known devices of the aforementioned type, examples of such devices being disclosed in SE-380 496-A, SE-509 532-C and SE-509 534-C. As described in these specifications, the free end of the wire is fed forwards through the cutting and twisting means and is guided round the bale by a guide means. When the wire end reaches the cutting and twisting means for the second time, feed is stopped and the wire end is gripped and held. The guide means releases the wire and the feed means is reversed in order to tighten the wire round the bale, whereafter the wire is cut and the ends twisted to form a knot. The reverse fed wire is used in the next binding operation. Known devices have a high noise level and suffer frequent breakdowns due to kinks and tangles in the wire.

Purpose and brief description of the invention

It is the purpose of the invention to improve reliability and availability, to reduce the noise level, to reduce the risk of kinks and tangles in the wire, to reduce the mechanical stresses on the device, and to permit a high feed rate of the wire. This is achieved in principle by a resilient device between the feed means and the wire magazine and close to the feed magazine in order to damp the jerk that occurs when the slack loop of wire runs out and wire starts to be drawn from the magazine. The invention is defined by the claims.

Brief description of drawings representing an embodiment of the invention

- Figure 1 shows a partly cut away view of a binding machine according to the invention during forward feeding of the wire.
- Figure 2 shows the same view of the machine during tightening of the wire.
- Figure 3 shows in an enlarged view the feed unit appearing in Figure 1.

Detailed description of illustrated and preferred embodiment

The binding device shown in the figures has a frame 10 supporting a number of units for different operations. A feed unit 11 is arranged to feed binding wire, commonly steel wire, 12 from a wire magazine (not shown) in the form of a reel from which the wire is unwound. A wire guide means in the form of a rail 14 encircles the pulp bale 13 to be bound. The bale 13 is carried by a bale feed conveyor 15, 16, in a direction perpendicular to the plane of the paper, into the guide rail 14. A binding unit 17 comprises means for cutting the wire, gripping the wire ends and twisting the wire ends. The binding unit is of conventional type and is not shown and described in detail, reference being made to the patent specifications above-mentioned.

The feed unit 11 is shown in the figures with a cover plate removed and is shown enlarged in Fig. 3. It comprises a feed pulley 20 driven by a reversible motor (not shown), and the wire 12 is compressed against the feed pulley by pressure rollers 19, 21, 22 in order to exert frictional force on the wire. The wire passes around a change-of-direction pulley 23, via a guide pulley 24, around three change-of-direction pulleys 25, 27, 27 and a guide pulley 28, to a feed pulley 20. The three change-of-direction pulleys 25 through 27 are mounted upon a block 30 which slides on a guide pin 29 which is fixed relative to the frame, which block is pressed by means of a spring 31 towards an outer end position, the wire tension being opposed to the force of the spring . The force of the spring is appropriately adjusted so that under normal wire tension the block 30 is barely retained in its outer end position. Inasmuch as the tension in the wire gives rise to a resultant force on the block 30 which is parallel to and coaxial or almost coaxial with the guided motion of the block, no lateral forces will be acting on the guided motion of the block.

Fig. 1 shows the binding device during forward feeding of the wire at a point when the feed pulley 20 has fed the free end 32 of the wire 12 around the bale 13 and the end has been guided by the guide rail 14 back to the binding unit 17. The binding unit 17 then grasps and holds the wire end 32. The wire guide rail 14 is axially split and opens at this time, releasing the wire 12, and when the feed pulley 20 reverses direction, the wire will be tightened around the bale 13 as shown in Fig. 2. When the wire 12 tightens as

shown in fig 2 the reverse fed wire will form a slack loop 33 in a longish wire take-up unit 34. When the wire 12 is tightened, the binding unit 17 will cut off the wire and twist the ends to form a knot.

After a wire has been passed round the bale as described, the bale is moved a certain distance forward by the bale conveyor 15, 16 to receive another lap of wire. The feed pulley 20 again begins feeding the wire end, and at first wire is taken from the slack loop 33 left by the preceding reverse feed operation and the feed pulley 20 quickly attains the full feed rate which may be e.g. 4.5 m/s. When the slack runs out and the slack loop reaches the three change-of-direction pulleys 25–27 mounted on the block 30, the wire will begin to be drawn from the change-of-direction pulley 23 and the stationary wire will begin to accelerate up to the feed rate. The jerk that occurs when the slack loop of wire reaches the change-of-direction pulleys 25–27 will compress the spring 31, thus damping the jerk in the stationary portion of the wire so that it can accelerate smoothly. The spring should not be pre-stressed and its progressivity should be such that there is time for the force exerted by the wire to brake the return motion of the block so that the block does not stop abruptly in its normal position, as this could cause a risk of kinking and tangling of the wire, even though the motion of the block 31 when the slack loop 33 of wire reaches the three change-of-direction pulleys 25–27 reduces the risk thereof. The spring-loaded block 31 achieves a considerable reduction in the risk of kinking and tangling of the wire and simultaneously reduces the stress on the feed pulley 20 and on its motor and gearbox if any, which may result in increased lifetime of these parts. Application of the invention permits the use of a very high wire feed rate.